

**Assessment of the Status and Distribution of the Endemic Rim Rock  
Crowned Snake (*Tantilla oolitica*) in Miami-Dade and Monroe Counties,  
Florida**

Final Report  
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**Project Background:**

The rim rock crowned snake (*Tantilla oolitica*) is one of three species of small, burrowing snakes within the genus *Tantilla* found in Florida. Of the more than 40 species of this genus extending from the southeastern United States down to northern Argentina in South America, *T. oolitica* has the most limited distribution (Wilson 1982, Scott 2004). Confined to the Miami Rock Ridge in southeastern Miami-Dade County and parts of the Florida Keys in Monroe County, this species has been greatly affected by the rapid urbanization of this area. By 1975 it had already made the Florida State list of threatened species and it is currently considered a candidate for the Federal Endangered Species List.

Traditionally, *T. oolitica* habitat included rockland hammocks and pine rocklands. Less than 2% of the pine rocklands on the Miami Rock Ridge currently remain (Snyder et. al 1990, USFWS 1999) and rockland hammocks both in Miami-Dade County and throughout the Florida Keys have been reduced to less than half their original extent and continue to face threat of development (Enge et. al 1997, USFWS 1999). Appropriately demonstrating the pressures faced by *T. oolitica*, the site where the original holotype was discovered, SW 27<sup>th</sup> Avenue and SW 24<sup>th</sup> Street in Miami, became the site of a supermarket shortly after this species was state listed (Porras and Wilson 1979).

Based on several observations of *T. oolitica* in disturbed areas and under piles of rubbish (ex. Porras and Wilson 1979, Bartlett 2002) and due to their small home range needs (Scott 2004), speculations are that the species may adapt well to living in an urbanized setting (Campbell 1978, 1992). The thought is that the species may persist if pertinent conservation areas exist and cities are structured to allow for green belts, parks and areas of low human density (Campbell 1978, 1992). It is difficult, however, to create management recommendations based on the little we know. In order to increase our knowledge of this secretive species, Grant Agreement #401817G006 between the U.S. Fish and Wildlife Service and The Institute for Regional Conservation was signed in November 2006 and grant modification #1 with appropriation #41420-1115-0000 for additional funding was signed in August 2008 to extend the survey to pursue a possible range extension for the species throughout the lower Florida Keys based on a sighting at Big Pine Key in December 2007. Study objectives were to (1) assess the current status and distribution of *T. oolitica* within its historic range; (2) increase our understanding of *T. oolitica*'s natural history and habitat requirements; and (3) develop management recommendations for this state listed species.

**Project Methods:***Permits –*

Permits were acquired from the Florida Department of Environmental Protection (# 5-08-03 and 5-09-18), the Miami-Dade County Parks and Recreation Department (# 103R), the State of Florida Fish and Wildlife Conservation Commission (# WX07099 and # LSSC-09-0151) and the U.S. Fish and Wildlife Service (# 41581-07-01 and # 41580-2009-019).

Cover Photo: *Tantilla oolitica* (rim rock crowned snake) captured at Dove Creek Hammock in May 2007, taken by IRC Biologist Kirsten Hines.

### *Background Research and Interviews –*

Over 60 researchers, hobbyists and people in relevant careers were directly contacted for information on potential *T. oolitic*a sightings. In addition, museums with known *T. oolitic*a holdings were contacted for information on their specimens, Florida Natural Areas Inventory (FNAI) was contacted for relevant information in their files and a posting was placed on the “Field Herp Forum” ([www.fieldherpforum.com](http://www.fieldherpforum.com)). All information gathered on sightings was entered into a Microsoft Access database and was mapped using ArcGIS.

### *Coverboards –*

Twelve conservation areas within *T. oolitic*a’s historic range in Miami-Dade and Monroe counties were selected for repeated monitoring throughout this study. At least one and no more than three coverboard arrays were placed at each of these selected sites in late February and early March of 2007 for a total of 28 coverboard arrays. Each array consisted of three independently numbered 2X4-foot pieces of 1/2-inch thick plywood. Table 1 gives distribution details for the arrays and Figure 1 shows a map of the arrays in relation to all currently known *T. oolitic*a sightings, though this includes an extension past Marathon which was the accepted southernmost range for the species at the time the board locations were chosen. The coverboard arrays were primarily placed in hammock habitat because the records available at the time indicated that this was the preferred habitat.

The coverboard arrays were left undisturbed from installation until May 2007 to allow for microhabitat development. Once monitoring began, boards were individually lifted by one person while at least one other person watched for fleeing wildlife and then searched beneath the board, taking care to rake through the leaf litter. All reptile and amphibian species found under the boards were recorded both by array and by individual board number. For the months of May and June 2007, all 28 coverboard arrays were checked monthly. Due to the frequent disturbance and low rainfall, however, the boards were believed to be too dry to be effectively utilized by *T. oolitic*a. In order to address this issue, holes were drilled into all boards during June and July and the sampling regime was modified such that individual boards were checked once every other month. As a result, coverboard arrays in Miami-Dade County were monitored in May, June, July, September and November of 2007 and January, March and May of 2008. Monroe County coverboard arrays were monitored in May, June, August, October and December of 2007 and February and April of 2008.

### *Opportunistic Searches –*

Opportunistic searches were conducted each month at one or both of the counties based on the schedule outlined above for coverboard monitoring. Searches consisted of all researchers and volunteers spreading out within an area and systematically searching beneath all moveable rocks, logs and other cover items. All amphibian and reptile species found during the survey period were recorded individually, though brown anoles (*Anolis sagrei*) are only reported when they were found under cover materials due to their abundance at most sites and more arboreal nature which distracted from *T. oolitic*a

searching. A GPS location was recorded at the start of each survey period and time was recorded at the start and end of the search to standardize findings by search effort (person hours). With occasional exceptions, the conservation areas containing coverboard arrays were searched upon every visit. In addition, privately and publicly owned areas containing appropriate habitat within *T. oolitica*'s historic range were also searched as permission was granted. Additional opportunistic searches were done at various sites between Marathon and Key West in 2009 in response to a sighting on Big Pine Key in December 2007 that suggested their range might extend through the entire length of the Florida Keys. Table 2 provides an overview of all sites visited and associated search effort by person hours (see Figure 2 for mapped locations).

### **Project Results To Date:**

#### *Background Research and Interviews –*

Data was collected for at least 80 sightings of *T. oolitica* (Table 3; mapped on Figure 3 as possible) between 1934 and 2009. Sources included 23 museum specimens, 3 FNAI records and 10 personal accounts from interviews. Most of the people contacted as potential sources responded, but had no data to contribute. There were occasional interviewees, however, who acknowledged having seen *T. oolitica*, but were uncooperative in divulging details. Most interviewees with sightings to report had information on one or two, but Glenn Freid, a former naturalist at Bill Sadowski Park and the Deering Estate, reported at least 41 sightings from his tenure at those parks 10-25 years ago. He saw a total of 15-20 at Bill Sadowski and 6-8 at the Deering Estate, but was unable to give an accurate estimate for a third site at which densities were high and he was confident that he was seeing some of the same individuals repeatedly. He reported consistently finding 1-10 at each visit to the latter site, with 12 being the maximum seen in any one day. This area of extreme density was an abandoned house on a lot between the two parks. The yard had several plywood boards strewn across it and he said they invariably had *T. oolitica* under them in densities of up to eight under a single board. This site was the only he knew of with those high numbers and unfortunately, the site was developed and no longer exists.

Another record of interest is the December 2007 report by Nathan Shepard from Big Pine Key. Historically Marathon has been considered the southernmost range for *T. oolitica*. A 1938 museum specimen, currently housed at the Milwaukee Public Museum, is recorded from Key West, but has generally been disregarded since the locality data was never verified and no further sightings were made in the Lower Florida Keys. This Big Pine Key sighting suggests that the locality data for the Key West specimen may be correct. At the very least, it indicates that the species' range may extend the entire length of the Keys and was the impetus for expanding this particular survey to include locations between Marathon and Key West.

Sixty-seven (67) recorded sightings had associated habitat data. Of these, 36 were from disturbed habitats (roadsides, vacant lots, trash piles) and 31 were from natural areas (hammock, pine rockland, or hammock ecotone). Within the natural area habitats, the majority of sightings were in hammock-pineland ecotone with at least 15 sightings attributed to this habitat type. Seven sightings were described as being from hammock,

three were attributed to pine rockland and the six to eight sightings from the Deering Estate were uncertainly distributed between these two habitat types.

Thirty-five (35) records had associated time of year data. The majority of findings were made between March and June with 24 of the observations occurring in this time period – 6 in March, 7 in April, 4 in May, 3 in June and another 4 attributed to the May to June period. The remaining observations were distributed throughout the other months of the year with only October having more than one observation for a total of three.

In terms of comparisons across years, the period from 1971 to 1990 had the highest number of observations at 18. Between 1930 and 1950 there were 6 reported observations; between 1951 and 1970 there were 6 reported sightings; and from 1991 to present there have been 12 reported sightings (current study included). Sightings reported with a range of years were not included in this calculation if the range did not fall entirely within the categories presented above.

#### *Coverboards –*

No individuals of *Tantilla oolitica* were found under coverboards. Two hundred sixty two (262) other amphibians and reptiles, representing seven different species (omitting species identified only to genus), were recorded beneath coverboards during this survey: 157 greenhouse frogs (*Eleutherodactylus planirostris*); 59 reef geckos (*Sphaerodactylus notatus*); 27 tropical geckos (*Hemidactylus mabouia*); 6 southeastern five-lined skinks (*Eumeces inexpectatus*); 5 ring-necked snakes (*Diadophis punctatus*); 3 brown anoles (*A. sagrei*); 2 Brahminy blind snakes (*Ramphotyphlops braminus*); 2 unidentified geckos (*Hemidactylus* sp.); and one unidentified toad (*Bufo* sp.). A shed snake skin the right size for *T. oolitica* was also discovered under a coverboard at Blue Heron Hammock in Marathon. The skin was sent to Paul Moler at the Florida Fish and Wildlife Conservation Commission (FFWCC) for identification aid and while he was reasonably sure it was from a ring-necked snake, he sent it to Trip Lamb at East Carolina University for definitive DNA testing. No results were ever received. A list of findings by location is found on Table 4.

#### *Opportunistic Searches –*

Two hundred thirty two (232) person hours (including 95.35 volunteer hours) were spent searching 52 different sites (Table 2 for list; Figure 2 for map) for this project. In addition to the 12 regularly visited sites containing the coverboard arrays, 26 additional locations within *T. oolitica*'s accepted historic range were searched (16 in Miami-Dade and 10 in Monroe counties), and 14 sites were searched within the area of potential range extension between Marathon and Key West. Two *T. oolitica* were discovered using this method (details to follow) and 345 other amphibians and reptiles, representing 22 species (omitting species identified only to genus), were recorded during opportunistic searches: 77 greenhouse frogs (*E. planirostris*); 65 reef geckos (*S. notatus*); 61 tropical geckos (*H. mabouia*); 48 brown anoles (*A. sagrei*); 18 Brahminy blind snakes (*R. braminus*); 15 ring-necked snakes (*D. punctatus*); 11 black racers (*Coluber constrictor*); 9 unidentified geckos (6 *Hemidactylus* sp. & 3 *Sphaerodactylus* sp.); 8 green anoles (*Anolis carolinensis*); 6 southeastern five-lined skinks (*E. inexpectatus*); 5 green iguanas (*Iguana*

*iguana*); 3 yellow rat snakes (*Elaphe obsoleta*); 3 mangrove salt marsh snakes (*Nerodia clarkii compressicauda*); 2 southern toads (*Bufo terrestris*); 2 Florida box turtles (*Terrapene carolina bauri*); 2 six-lined racers (*Cnemidophorus sexlineatus*); 2 narrow-mouthed toads (*Gastrophryne carolinensis*); 2 ashy geckos (*Sphaerodactylus elegans*) and single individuals of cottonmouth snake (*Agkistrodon piscivorous*), Puerto Rican crested anole (*Anolis cristatellus*), bark anole (*Anolis distichus*), gopher tortoise (*Gopherus polyphemus*), leopard frog (*Rana sphenoccephala*) and Florida brown snake (*Storeria dekayi victa*). Due to the abundance of brown anoles, this species was only reported when discovered beneath cover items as opposed to its usual distribution amongst trees and shrubs. A complete list of the findings by location can be found on Table 4.

Two *T. oolitica* were discovered during opportunistic searches for this project. One was seen by Kirsten Hines, but not captured, at the Barnacle Historic State Park on May 8, 2007 at 8:45 am. This individual was discovered in a loose pile of rock and moist, dark soil about 15 cm beneath the surface. The location was within hammock just a few meters away from the coverboard array for this site. The second *T. oolitica* was discovered by Michael Rochford at 9:50 am on May 25, 2007 at Dove Creek Hammock on Key Largo. This individual was less than ten centimeters beneath the surface and was coiled under a rotting board in moist, dark soil. This location was also in hammock just a few meters from the middle coverboard array for this site. The temperature at the capture site was 25°C and the relative humidity was 80%. The snake itself was 19.9 cm total length and weighed 1.65 g. Sex was not determined for this individual. A shed snake skin the right size for *T. oolitica* was also discovered at Dove Creek Hammock in the general vicinity and time of this discovery, but DNA results were never received to confirm whether it was the target species or a similarly sized ring-necked snake.

## **Discussion:**

### *Assessment of Current Status and Distribution –*

The rim rock crowned snake (*Tantilla oolitica*) continues to be an elusive species with limited number of sightings. Many Florida herpetologists (professional and hobbyists) interviewed had never seen one despite attempts to find them. Of the few who had, only one or two could report having seen more than one or two snakes, with only one subject claiming to regularly find them and at relatively high densities. Despite the consistently low numbers, an average of only 10 sightings per 20 year period, the number of sightings has been highest in the last two 20 year periods. The period from 1930 to 1950 and from 1951 to 1970 each had only 6 sightings while it jumped to 18 between 1971 and 1990 and is at 12 for the period between 1991 to present. These data indicate that the population is either stable or on the increase, though interpretations are difficult given the scarcity of data and influencing factors. The apparent increase in number of sightings may be an artifact of the urban expansion and population growth that South Florida continues to experience, which began in this era of increased sightings. Given the fact that only two individuals were found in over a year of searching and that there are currently no known areas to find the species consistently nor in numbers greater than one, it is doubtful that the population is increasing.

In terms of distribution, given the Big Pine Key sighting in December of 2007 and the museum specimen from Key West, it seems likely that their distribution runs the entire extent of the Florida Keys. While our searches between Marathon and Key West failed to uncover further individuals, there was plenty of ideal habitat in the area and there were a couple of leads that suggest further searching should be done. While acquiring permission to work at sites both in Key West and on Big Pine Key, indirect sources claimed to know someone who thought they had seen a *T. oolitica* on each of those islands – near the Airport Road entrance of Little Hamaca Park in Key West and at the “boneyard” area of the National Key Deer Refuge on Big Pine Key. Both areas were unsuccessfully searched during our Lower Keys survey and no further information could be collected from the direct sources to verify the sightings one way or the other. At the very least, *T. oolitica*’s accepted range must be extended to Big Pine Key given Nathan Shepard’s documented finding.

#### *Natural History and Habitat Requirements –*

Sightings over time suggest that *T. oolitica* is an adjustable species. It has occurred in a range of habitats over the years, including rockland habitats, dump sites and various urban and agricultural landscapes. The *T. oolitica* discovered during this study were both in hammock habitat with closed canopy and loose, dark, moist soil. The site of the Big Pine Key finding was at an informal dump in pineland-hammock ecotone where carpet and old ply boards seemed to maintain moisture in an otherwise dry landscape. Louis Porras, a researcher who worked with the species in the 1970’s (see Porras & Wilson 1979), was concerned that the ongoing lowering of South Florida’s water table may negatively affect this species, driving them from pine rockland habitats as conditions become too dry for centipedes and beetle larvae, their main food sources. Whether food supply is the driving force or not, moisture seemed to be a common habitat factor for the most recent sightings. A study on centipede and beetle larvae distribution and numbers may help clarify this trend.

The fact that one of the sightings in this study was at the Barnacle Historic State Park, a site containing less than 4 acres of hammock and the smallest property regularly monitored in the study, verifies previous assumptions (Campbell 1992) that this species is capable of adjusting to urban landscapes. This sighting verifies that very little habitat is required for their survival, presumably because they have minimal home range size requirements. We hoped to address home range to some extent through our mark recapture protocol, but no animals were recaptured despite repeated searches at areas where individuals were previously caught.

Much research is still required to understand the natural history of this species, but their low frequency of discovery is an impediment. Two of the historic sightings for this species were based on roadkill sightings wherein they had been in the stomach of a coral snake. Stomach flushing coral snakes, dissecting roadkill coral snakes and/or dissecting coral snake museum specimens from within *T. oolitica*’s range may yield more information on *T. oolitica* itself.

*Management Recommendations –*

*Tantilla oolitica* is currently listed as Threatened by the State of Florida and is a candidate for listing under the Federal Endangered Species Act. One incentive of this project was to determine whether the species should be elevated from candidate status to Federally “Threatened” or “Endangered”. Following this study, we feel that the species should be considered for listing at this time. According to a U.S. Fish and Wildlife publication (USFWS 2009), “A species is added to the list when it is determined to be endangered or threatened because of any of the following factors:

- *The present or threatened destruction, modification or curtailment of its habitat or range;*
- *Overutilization for commercial, recreational, scientific, or educational purposes;*
- *Disease or predation;*
- *The inadequacy of existing regulatory mechanisms;*
- *The natural or manmade factors affecting its survival.”*

The first and the last factors in this list are applicable to *Tantilla oolitica*. While the species appears adaptable to urban expansion, there is likely a limit to that tolerance. Miami-Dade County is one of the densest and most rapidly developing areas in the nation with rockland habitats being amongst the most threatened. Given the low numbers of this species, hitting the threshold of their tolerance to urbanization could lead to extinction, particularly given that they are endemic to this region and a large portion of their range is within this expansion zone.

Also relating to the rapid urbanization of the area, human demands on the natural water supply may also impact this species, making it a candidate for the last item in the above list of factors. It is unclear to what extent this species is dependent upon the water table, but moisture does appear to be a factor in their distribution and likely that of their food source. Restoration efforts in the greater Everglades region may reduce this factor in the future, but water levels throughout the area are a concern at the moment and may directly impact this species.

Another management recommendation includes future monitoring. Their range clearly needs to be extended to Big Pine Key, but extension all the way to Key West requires confirmed reports. Increased captures would also aid in establishing a population estimate and status assessment, as well as increasing our knowledge on their natural history. Opportunistic searches were most effective in this study, but coupling them with drift fences would likely increase success. Establishing permanent arrays in areas of optimal habitat within their range, including the Lower Keys, would likely be the most efficient way to monitor this species. Accomplishing a mark-recapture or radio telemetry study on *T. oolitica* would greatly increase our knowledge on this species and its needs.

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Table 1. Coverboard array distribution by location and habitat type.

<b>Location</b>	<b>Habitat Type</b>	<b>UTM Easting</b>	<b>UTM Northing</b>
<i>Miami-Dade County</i>			
Bill Sadowski Park	Hammock	568426	2832418
Bill Sadowski Park	Hammock	568504	2832511
Bill Sadowski Park	Pine-Hammock Ecotone	568418	2832284
Matheson Hammock Park	Hammock	572846	2840617
Matheson Hammock Park	Hammock	572717	2840546
R. Hardy Matheson Preserve	Hammock	572317	2838799
The Barnacle Historic State Park	Hammock	575910	2845537
The Deering Estate at Cutler	Hammock	569842	2834185
The Deering Estate at Cutler	Pine Rockland	569540	2834372
The Deering Estate at Cutler	Pine-Hammock Ecotone	569548	2834271
<i>Monroe County</i>			
Blue Heron Hammock	Hammock	494535	2734720
Blue Heron Hammock	Hammock	494648	2734780
Crocodile Lake National Wildlife Refuge	Hammock	569996	2795405
Crocodile Lake National Wildlife Refuge	Hammock	567620	2790450
Crocodile Lake National Wildlife Refuge	Hammock	564077	2785375
Curry Hammock State Park	Hammock	498889	2735751
Curry Hammock State Park	Hammock	500055	2736262
Curry Hammock State Park	Hammock	501254	2736738
Dove Creek Hammock	Hammock	550167	2768474
Dove Creek Hammock	Hammock	550270	2768622
Dove Creek Hammock	Hammock	550665	2769091
Key Largo Hammocks Botanical State Park	Hammock	570517	2795862
Key Largo Hammocks Botanical State Park	Hammock	570352	2797901
Key Largo Hammocks Botanical State Park	Pine-Hammock Ecotone	570955	2796838
Lignumvitae Key Botanical State Park – Teatable Hammock on Upper Matecumbe Key	Hammock	534813	2754152
Long Key State Park	Hammock	518025	2744944
Long Key State Park	Hammock	518401	2745386
Long Key State Park	Hammock	518376	2745376

Table 2. Sites visited during this project with associated person hours of survey effort.

Location	Total Person Hours
Big Pine Key - "Boneyard"	4.25
Big Pine Key - 19th St	0.2
Big Pine Key - 610 Wilder Rd	0.25
Big Pine Key - Ixora Dr	3.5
Big Pine Key - South St (dumping site)	0.5
Big Pine Key - Watson Hammock	5
Cudjoe Key - by dump	5
Cudjoe Key - off Valencia Rd	2.25
Fat Deer Key - Curry Hammock SP	9.75
Islamorada - Hammock Fragment near Founder's Park	1
Key Largo - Crocodile Lake NWR	12.5
Key Largo - Dove Creek Hammocks	12.75
Key Largo - Hammock E of Blue Runner b/n Bonito & Dolphin Aves.	0.75
Key Largo - Hammock NE of Blue Runner & Bonito	1.5
Key Largo - Hammock SE of Blue Runner & Bonito	1.5
Key Largo - John Pennecamp SP	1
Key Largo - Road Median (by power pole B3-213)	0.75
Key Largo - Road Median (MM 97.5)	1.5
Key Largo Hammocks Botanical SP	14
Key Largo Ranger Station (ENP)	1.5
Key West - Little Hamaca Park, Airport Rd & Bahama Dr.	1.25
Key West - Little Hamaca Park, main entrance area	2
Key West Botanical Garden - hammock	3.5
Key West Botanical Garden - stone wall	2.5
Long Key - Long Key SP	6.75
Lower Sugarloaf Key - Sugarloaf Blvd	3
Marathon - Blue Heron Hammock	7.5
Marathon - Crane Point	1.5
Marathon - Hammock Fragment	1
Miami - A.D. Barnes	2
Miami - Alice Wainwright	2.25
Miami - Barnacle Historic SP	11
Miami - Bill Sadowski Park	13
Miami - Boy Scout Property on 157 & 256	2
Miami - Camp Owaissa Bauer	3.5
Miami - County Health Facility Property	2.25
Miami - Deering Estate	16.75
Miami - George Avery Pineland (IRC)	2.25
Miami - Hattie Bauer	2
Miami - Kendall Indian Hammock Park	2
Miami - Ludlam Pineland	1
Miami - Matheson Hammock Park	13.75
Miami - Ned Glenn Pineland	2.5

*Table 2 Continued.*

<b>Location</b>	<b>Total Person Hours</b>
Miami - R. Hardy Matheson Preserve	9.25
Miami - Seminole Wayside Park	2
Miami - Silver Palm Groves	2.25
Miami - Simpson Park	2.25
Miami - USDA Property on Old Cutler Rd	4
Miami - Vizcaya	3
Miami - Whispering Pines Hammock	2
No Name Key	15.1
Upper Matecumbe - Lignumvitae Botanical SP	7.75
<i>Total:</i>	232.3

Table 3. Summary of *Tantilla oolitica* sightings based on literature and interviews, not including two sightings from this study.

Year	Month	Source	Location	Habitat (# if more than 1)
1934	January	Museum of Comparative Zoology, Harvard (H. Loomis)	Chapman Field, Old Cutler Road, Miami-Dade County, FL	
1938		Milwaukee Public Museum (H. Jungmann)	Key West, Monroe County, FL*	
1941	March	Carnegie Museum of Natural History (G. R. Campbell)	Coral Gables, Miami-Dade County, FL	
1945	March	Natural History Museum, U Kansas (G. Knowles)	Coral Gables, Miami-Dade County, FL	
1948	May	National Museum of Natural History (W.E. Haast)	Kendall, Miami-Dade County, FL	
1950	March	Florida Museum of Natural History, U Florida (W. Auffenberg)	SW Miami, Miami-Dade County, FL	Pasture
1951	April	Museum of Zoology, U Michigan (A. Shwartz)	SR-905 on North Key Largo, Monroe County, FL	
1954	October	Natural History Museum, U Kansas (R. Patterson)	Miami-Dade County, FL	
1955	April	Florida Museum of Natural History, U Florida (D. Paulson)	SW 27 Avenue & SW 24 Street, Miami-Dade County, FL	Vacant lot (2)
1955	April	Natural History Museum of Los Angeles County (D. Paulson)	SW 27 Avenue & SW 24 Street, Miami-Dade County, FL	Vacant lot
1969	April	Florida Museum of Natural History, U Florida (T. Krakauer)	Old Cutler Road & Red Road, Miami-Dade County, FL	
1976	September	Florida Museum of Natural History, U Florida (local resident)	near Marvin D. Adams Waterway, Key Largo, Monroe County, FL	
1978	February	Florida Museum of Natural History, U Florida (L.D. Wilson)	Grassy Key, Monroe County, FL	
1978	June	Florida Museum of Natural History, U Florida (J. Fernandez)	Grassy Key, Monroe County, FL	Field adjacent to hammock
1979	July	Robert Ehrig	Tavernier, Key Largo, Monroe County, FL	Hammock
1979	November	Robert Ehrig	Plantation Key, Monroe County, FL	Secondary Hammock

Table 3 Continued.

<b>Year</b>	<b>Month</b>	<b>Source</b>	<b>Location</b>	<b>Habitat (# if more than 1)</b>
1980's	May - June	Roger Hammer	Bill Sadowski Park, Miami-Dade County, FL	Hammock-pineland ecotone
1980	March	Florida Museum of Natural History, U Florida (T. Barken)	US 1 & SW 154 Ave, Miami-Dade County, FL	
1981	March	Florida Museum of Natural History, U Florida (L. Porras)	Old Cutler Road b/t SW 168 St & SW 178 St, Miami-Dade County, FL	
1982	May	Florida Natural Areas Inventory (K. Achor)	North Creek Hammocks (MM 105), Key Largo, Monroe County, FL	Sidewalk
1982	May - June	Robert Line	Ned Glenn Pineland, Miami-Dade County, FL	Pine rockland
1982	May - June	Robert Line	West of Old Cutler slough in the Palmetto Bay area, Miami-Dade County, FL	Pine rockland
1983	April	Florida Natural Areas Inventory (M. Minno)	Arch Creek Park, Miami-Dade County, FL	Hammock
1983-1998		Glenn Freid	Old Cutler and SW 176th St, Miami-Dade County, FL	Abandoned house and lot (20+)
1983-1998		Glenn Freid	Bill Sadowski Park, Miami-Dade County, FL	Hammock-pineland ecotone (15-20)
1983-1998		Glenn Freid	Deering Estate at Old Cutler, Miami-Dade County, FL	Hammock-pineland ecotone and Pine rockland (6-8 total at site)
1984	May	Florida Natural Areas Inventory (P. Moler)	SR-905 on North Key Largo, Monroe County, FL	Roadside
1984	May - June	Robert Line	Ludlam Pineland area, Miami-Dade County, FL	
1985-2005		Joe Burgess	SW 112th Ave, Miami-Dade County, FL	Disturbed pine rockland, vacant lot
1985	March	Florida Museum of Natural History, U Florida (A. Nielson)	old entrance to John Pennekamp Coral Reef State Park, Key Largo, Monroe County, FL	Private backyard
1988	May	Florida Museum of Natural History, U Florida	Upper Maticumbe Key (MM 81), Islamorada, Monroe County, FL	40 feet from shore
1988	Summer	John Decker	Lower Matecumbe Key, Monroe County, FL	Disturbed hammock and edge

Table 3 Continued.

Year	Month	Source	Location	Habitat (# if more than 1)
1989	June	Florida Museum of Natural History, U Florida (G. Dalrymple)	Old Cutler Road, Miami-Dade County, FL	
1992	August	Barbara Gouldener	Bill Sadowski Park, Miami-Dade County, FL	Hammock edge by playground
1992-1996		Jim Duquesnel	Bonito Ave, Key Largo, Monroe County, FL	Roadside (2 <i>T. ooliticus</i> inside roadkill coral snake)
1992-1996		Jim Duquesnel	SR-905 on North Key Largo, Monroe County, FL	Roadside (1 <i>T. ooliticus</i> inside roadkill coral snake)
1996	April	Florida Museum of Natural History, U Florida (J. Decker)	Marathon b/t 36 St & 39 St, Vaca Key, Monroe County, FL	Hammock and edge
1997		Joseph Nemec	John Pennekamp Coral Reef State Park, Key Largo, Monroe County, FL	Maintenance area of park
2000	June	Florida Museum of Natural History, U Florida (J. Decker)	Marathon, Vaca Key, Monroe County, FL	Roadside
2002	October	John Decker	Marathon, Vaca Key, Monroe County, FL	Hammock and edge
2004	October	Florida Museum of Natural History, U Florida (J. Duquesnel)	Blue Runner St, Key Largo, Monroe County, FL	Roadside - roadkill
2007	December	Nathan Shepard	Big Pine Key, Monroe County, FL	Abandoned lot/ trash heap

\* This specimen generally disregarded in the literature because location data was never verified.

Table 4. Reptile and amphibian species recorded during surveys, listed by location and method of discovery (OS = Opportunistic Survey; CB = Coverboard).

Location	Common Name	Scientific Name	Quantity	Total	Method
<b>Miami - Dade County</b>					
A.D. Barnes Park	ring-necked snake	<i>Diadophis punctatus</i>	1	3	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	1		OS
Alice Wainwright Park	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1	4	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
Barnacle Historic SP	black racer	<i>Coluber constrictor</i>	1	22	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	4		CB
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	7		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	8/1		OS/CB
	rim rock crowned snake	<i>Tantilla oolitica</i>	1		OS
Bill Sadowski Park	ring-necked snake	<i>Diadophis punctatus</i>	2	16	CB
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	7		CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	1/6		OS/CB
Camp Owaisa Bauer	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1	1	OS
The Deering Estate at Cutler	toad sp.	<i>Bufo sp.</i>	1	48	CB
	southern toad	<i>Bufo terrestris</i>	2		OS
	black racer	<i>Coluber constrictor</i>	1		OS
	ring-necked snake	<i>Diadophis punctatus</i>	5/2		OS/CB
	yellow rat snake	<i>Elaphe obsoleta</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	2/10		OS/CB
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	3		CB
	gopher tortoise	<i>Gopherus polyphemus</i>	1		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	2		CB
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	2/1		OS/CB
reef gecko	<i>Sphaerodactylus notatus</i>	7/8	OS/CB		
Hattie Bauer Hammock	gecko sp.*	<i>Hemidactylus sp.</i>	1	3	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	2		OS
Kendall Indian Hammocks	ring-necked snake	<i>Diadophis punctatus</i>	1	4	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	1		OS
	Florida brown snake	<i>Storeria dekayi victa</i>	1		OS
Ludlam Pineland	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	2	3	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1		OS
Matheson Hammock Park	black racer	<i>Coluber constrictor</i>	1	44	OS
	ring-necked snake	<i>Diadophis punctatus</i>	2/1		OS/CB
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	7/16		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		CB
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	5/9		OS/CB
Florida box turtle	<i>Terrapene carolina bauri</i>	1	OS		
Ned Glenn Pineland	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	1	1	OS
R. Hardy Matheson Preserve	brown anole*	<i>Anolis sagrei</i>	3	19	OS
	black racer	<i>Coluber constrictor</i>	1		OS
	ring-necked snake	<i>Diadophis punctatus</i>	1		OS

Table 4 Continued.

Location	Common Name	Scientific Name	Quantity	Total	Method
R. Hardy Matheson Preserve	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	5		CB
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	1		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3/1		OS/CB
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	1/1		OS/CB
	reef gecko	<i>Sphaerodactylus notatus</i>	2		OS
Seminole Wayside Park	reef gecko	<i>Sphaerodactylus notatus</i>	2	2	OS
Simpson Park	brown anole*	<i>Anolis sagrei</i>	4	11	OS
	ring-necked snake	<i>Diadophis punctatus</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	3		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
South Dade County Health Facility	black racer	<i>Coluber constrictor</i>	1	2	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
USDA Chapman Field Station on Old Cutler	Puerto Rican crested anole*	<i>Anolis cristatellus</i>	1	3	OS
	ring-necked snake	<i>Diadophis punctatus</i>	1		OS
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	1		OS
Vizcaya Museum & Gardens	brown anole*	<i>Anolis sagrei</i>	5	7	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1		OS
Whispering Pines Hammock	tropical gecko*	<i>Hemidactylus mabouia</i>	2	4	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	2		OS
<b>Upper Florida Keys</b>					
Blue Heron Hammock	green anole	<i>Anolis carolinensis</i>	1	31	OS
	bark anole*	<i>Anolis distichus</i>	1		OS
	brown anole*	<i>Anolis sagrei</i>	2		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	2/10		OS/CB
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	2/2		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	4/3		OS/CB
	gecko sp.*	<i>Hemidactylus sp.</i>	1		OS
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1/1		OS/CB
Crane Point, Marathon	reef gecko	<i>Sphaerodactylus notatus</i>	1	1	OS
Crocodile Lake NWR	brown anole*	<i>Anolis sagrei</i>	3/1	40	OS/CB
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	9/18		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		CB
	gecko sp.*	<i>Hemidactylus sp.</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1/6		OS/CB
Curry Hammock SP	Florida cottonmouth	<i>Agkistrodon piscivorous</i>	1	49	OS
	brown anole*	<i>Anolis sagrei</i>	5		OS
	black racer	<i>Coluber constrictor</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	6/23		OS/CB
	southeastern five-lined skink	<i>Eumeces inexpectatus</i>	1		CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	2/2		OS/CB
	gecko sp.*	<i>Hemidactylus sp.</i>	1		CB
	green iguana*	<i>Iguana iguana</i>	3		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1/3		OS/CB

Table 4 Continued.

Location	Common Name	Scientific Name	Quantity	Total	Method
Dove Creek Hammock	green anole	<i>Anolis carolinensis</i>	2	79	OS
	brown anole*	<i>Anolis sagrei</i>	10		OS
	black racer	<i>Coluber constrictor</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	15/15		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	5/5		OS/CB
	reef gecko	<i>Sphaerodactylus notatus</i>	6/19		OS/CB
	rim rock crowned snake	<i>Tantilla oolitica</i>	1		OS
Hammock E of Blue Runner b/t Bonito & Dolphin (Key Largo)	green anole	<i>Anolis carolinensis</i>	1	2	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
Hammock Fragment in Marathon (MM 57)	tropical gecko*	<i>Hemidactylus mabouia</i>	1	1	OS
Hammock Fragment near Founder's Park, Islamorada	tropical gecko*	<i>Hemidactylus mabouia</i>	2	3	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1		OS
Hammock NE of Blue Runner & Bonito (Key Largo)	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	3	6	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	3		OS
Hammock SE of Blue Runner & Bonito (Key Largo)	tropical gecko*	<i>Hemidactylus mabouia</i>	1	2	OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1		OS
John Pennecamp SP	brown anole*	<i>Anolis sagrei</i>	1	6	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	3		OS
Key Largo Hammocks Botanical SP	brown anole*	<i>Anolis sagrei</i>	4	44	OS
	black racer	<i>Coluber constrictor</i>	1		OS
	ring-necked snake	<i>Diadophis punctatus</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	4/16		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	2		OS
	yellow rat snake	<i>Elaphe obsoleta</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	6/9		OS/CB
Key Largo Ranger Station (Everglades NP)	brown anole*	<i>Anolis sagrei</i>	7	12	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	3		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	2		OS
Key Largo Road Median (by power pole B3-213)	green anole	<i>Anolis carolinensis</i>	1	2	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
Key Largo Road Median (MM 97.5)	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	2	3	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
Lignumvitae Key Botanical SP - Teatable Hammock & Klopp Tract	green anole	<i>Anolis carolinensis</i>	1	30	OS
	brown anole*	<i>Anolis sagrei</i>	1/1		OS/CB
	black racer	<i>Coluber constrictor</i>	1		OS
	ring-necked snake	<i>Diadophis punctatus</i>	1		OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	2/7		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	6/2		OS/CB
	Brahminy blind snake*	<i>Ramphotyphlops braminus</i>	3		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	1/3		OS/CB

Table 4 Continued.

Location	Common Name	Scientific Name	Quantity	Total	Method
	Florida box turtle	<i>Terrapene carolina bauri</i>	1		OS
Long Key SP	brown anole*	<i>Anolis sagrei</i>	3/1	42	OS/CB
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	6/26		OS/CB
	tropical gecko*	<i>Hemidactylus mabouia</i>	1/4		OS/CB
	gecko sp.*	<i>Hemidactylus sp.</i>	1		CB
<b>Lower Florida Keys</b>					
Watson Hammock, Big Pine Key	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1	13	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
	green iguana*	<i>Iguana iguana</i>	1		OS
	reef gecko	<i>Sphaerodactylus notatus</i>	8		OS
Valencia Rd., Cudjoe Key	ashy gecko*	<i>Sphaerodactylus elegans</i>	2	2	OS
Sugarloaf Blvd., Lower Sugarloaf Key	yellow rat snake	<i>Elaphe obsoleta</i>	1	3	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
	mangrove salt marsh snake	<i>Nerodia clarkii compressicauda</i>	1		OS
No Name Key	green anole	<i>Anolis carolinensis</i>	1	10	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	2		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	5		OS
	gecko sp.*	<i>Hemidactylus sp.</i>	1		OS
	gecko sp.	<i>Sphaerodactylus sp.</i>	1		OS
Little Hamaca Park - main entrance (Key West)	black racer	<i>Coluber constrictor</i>	1	7	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
	mangrove salt marsh snake	<i>Nerodia clarkii compressicauda</i>	2		OS
Key West Botanical Garden - hammock	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1	6	OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
	leopard frog	<i>Rana sphenoccephala</i>	1		OS
Key West Botanical Garden - stone wall	green anole	<i>Anolis carolinensis</i>	1	4	OS
	ring-necked snake	<i>Diadophis punctatus punctatus</i>	1		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	1		OS
	gecko sp.	<i>Sphaerodactylus sp.</i>	1		OS
Ixora & 15th, Big Pine Key	black racer	<i>Coluber constrictor</i>	1	5	OS
	greenhouse frog*	<i>Eleutherodactylus planirostris</i>	1		OS
	tropical gecko*	<i>Hemidactylus mabouia</i>	3		OS
Dumpsite, Cudjoe Key	tropical gecko*	<i>Hemidactylus mabouia</i>	2	3	OS
	gecko sp.	<i>Sphaerodactylus sp.</i>	1		OS
"Boneyard", Big Pine Key	six-lined racer	<i>Cnemidophorus sexlineatus</i>	2	5	OS
	narrow-mouth toad	<i>Gastrophryne carolinensis</i>	2		OS
	green iguana*	<i>Iguana iguana</i>	1		OS

\*Introduced species

Figure 1. Coverboard locations shown in relation to presently known *Tantilla oolitica* sightings. Marathon was considered the southernmost extent of the species' range at the beginning of this study when the coverboard arrays were established.

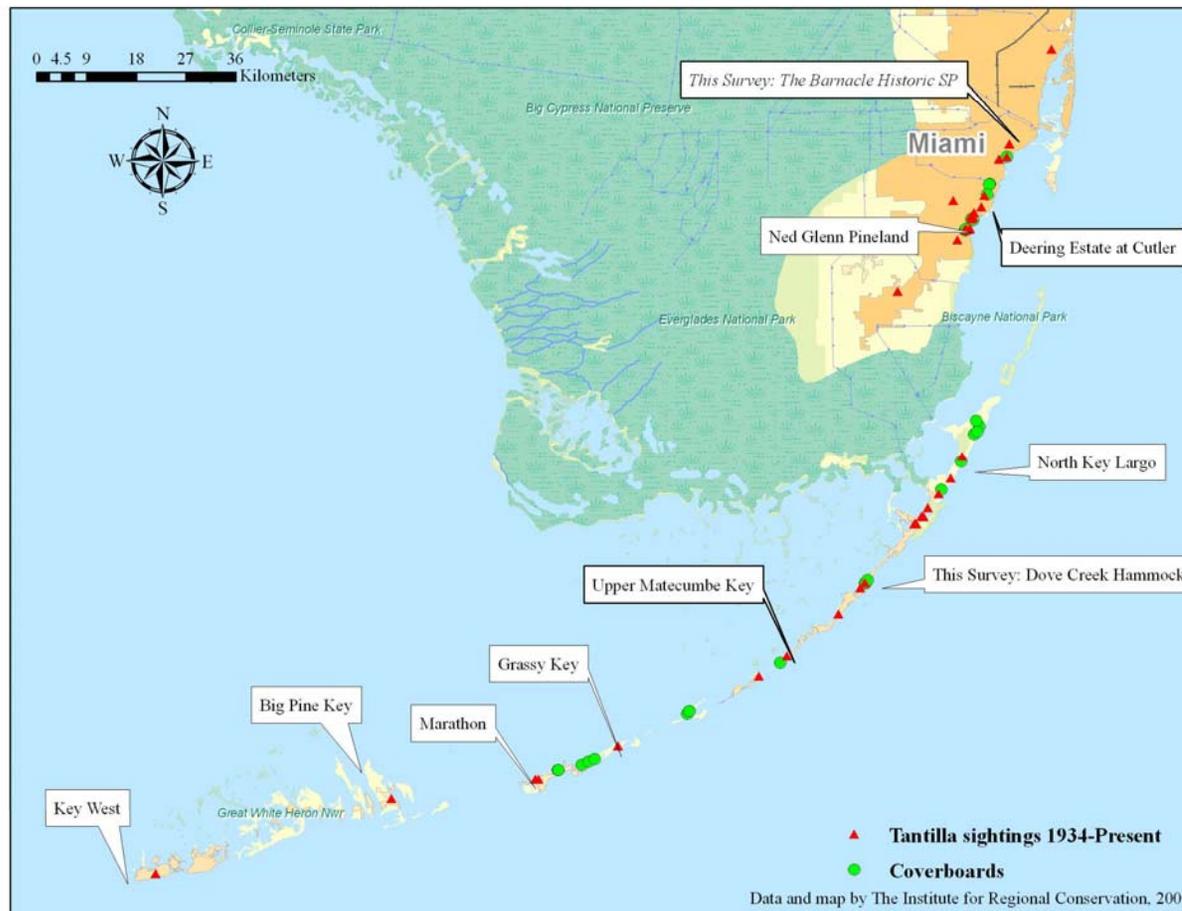


Figure 2. Sites surveyed during this project, shown in relation to presently known *Tantilla oolitica* sightings. Survey locations coded based on timing and frequency of visits (see legend below).

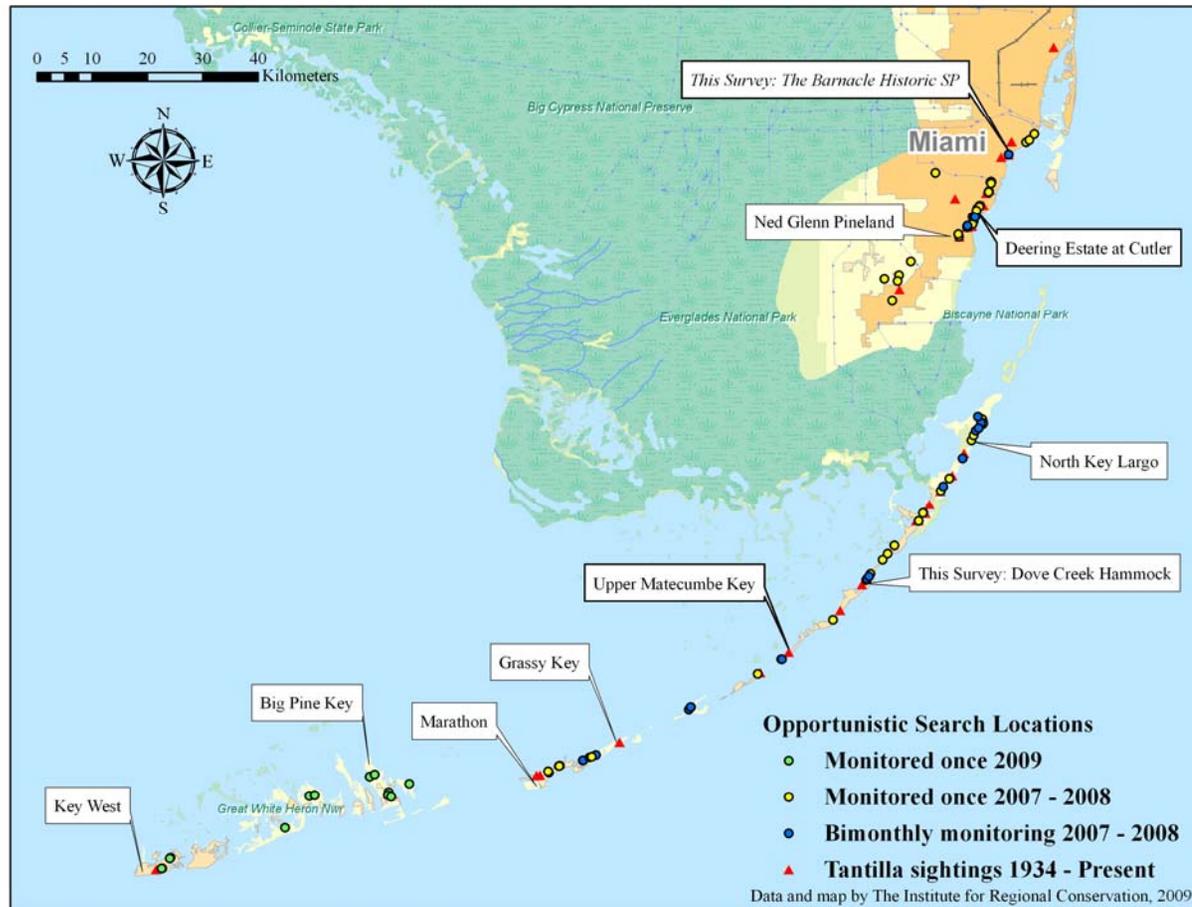


Figure 3. Presently known locations of *Tantilla oolitica* sightings coded by 20 year increments.

